Communication Services Projects & Services During LS2

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IT/CS

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Agenda

Projects

- Technical Network projects
- Telecom projects

IT services during LS2

- Networking
- VDSL Wi-Fi network
- TETRA services
- Mobile services

IT CS Projects for LS2

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Datacentre routers hardware upgrade

- Objective:
  - replace the old router hardware
  - This concerns ~20 routers
- Type of intervention:
  - Hardware upgrade
- Impacted locations:
  - Computer Centre and Wigner
- Impact on users:
  - Thanks to the network design, no service disruption is expected, but there will be no service redundancy during an intervention
- Impact on service if not done or postponed:
  - This could lead to higher outage rates, impossibilities to repair for hardware out of warranty/discontinued
  - Network outages impact accelerator operation
- Proposed period for implementation:
  - 2019-2020
- Estimated duration:
  - 1.5 years
- External resources:
  - To be managed by IT-CS

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Move of redundant routers to the New Network Hub

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- Objective:
  - Implement spatial redundancy for core networking
  - This concerns ~10 routers
- Type of intervention: hardware relocation
- Impacted locations:
  - Computer Centre and new network hub in Prevessin
- Impact on users:
  - Thanks to the network design, no service disruption is expected, but there will be no service redundancy during an intervention
- Impact on service if not done or postponed:
  - In case of disaster in CC, the CERN network could be unavailable for many days or even weeks
  - Network outages impact accelerator operation
- Proposed period for implementation:
  - *2019 (depend on new hub availability)*
- Estimated duration:
  - *6 months*
- External resources:
  - EN/EL: for power, fibres, CV, etc. (requests already being discussed)

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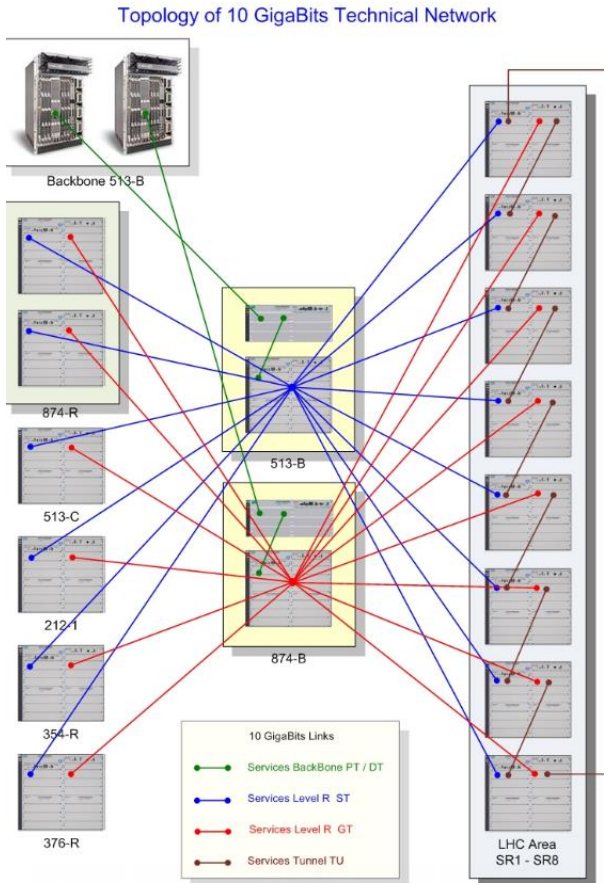
TN routers hardware upgrade

- Objective:
  - replace the old router hardware
  - This concerns ~30 routers
- Type of intervention:
  - Hardware upgrade
- Impacted locations:
  - All TN starpoints
- Impact on users:
  - Short service disruptions
- Impact on service if not done or postponed:
  - This could lead to higher outage rates, impossibilities to repair for hardware out of warranty/discontinued
  - Network outages impact accelerator operation
- Proposed period for implementation:
  - 2019
- Estimated duration:
  - 1 year
- External resources:
  - BE budget contribution (HW and manpower)
  - EN/EL (if redundant power supply...)



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Experiment routers hardware upgrade

- Objective:
  - replace the old router hardware
  - This concerns ~30 routers
- Type of intervention:
  - Hardware upgrade
- Impacted locations:
  - ALICE, ATLAS, CMS, NA62
- Impact on users:
  - Short service disruptions
- Impact on service if not done or postponed:
  - This could lead to higher outage rates, impossibilities to repair for hardware out of warranty/discountinued
  - Network outages impact accelerator operation
- Proposed period for implementation:
  - 2019
- Estimated duration:
  - 1 year
- External resources:
  - Experiment budget contribution (HW and manpower)
  - EN/EL (if redundant power supply...)

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Replacement of HP3400 and HP3500 in TN (and GPN)

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- Objective:
  - replace the old switches hardware
  - This concerns ~30 switches
- Type of intervention:
  - Upgrade
- Impacted locations:
  - CCC and CC (but be careful with service dependencies)
- Impact on users:
  - Users attached to the replaced switches will experience a few seconds of network disruption
- Impact on service if not done or postponed:
  - This could lead to higher outage rates, impossibilities to repair for hardware out of warranty/discontinued
  - Network outages impact accelerator operation
- Proposed period for implementation:
  - 2019
- Estimated duration:
  - 3 months
- External resources:
  - BE budget contribution (HW and manpower)
  - EN/EL (if redundant power supply...)

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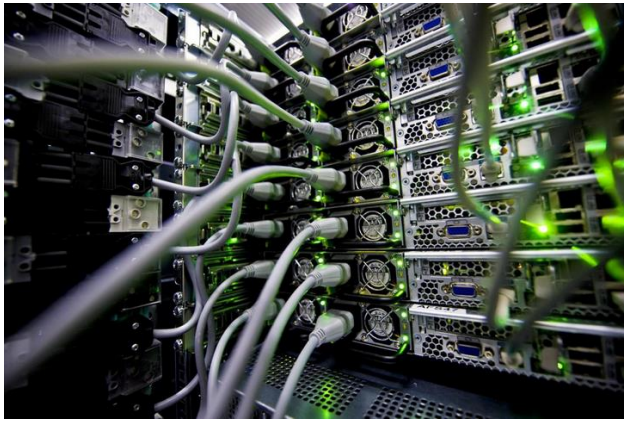
Deployment of CS servers in TN



- Objective:
  - Replace the old server hardware for DNS, DHCP, NTP
- Type of intervention:
  - Hardware upgrade
- Impacted locations:
  - Computer centre and CCC
- Impact on users:
  - In principle, none.
- Impact on service if not done or postponed:
  - This could lead to higher outage rates, impossibilities to repair for hardware out of warranty/discontinued
  - Network outages impact accelerator operation
- Proposed period for implementation:
  - 2019
- Estimated duration:
  - 4 months
- External resources:
  - IT-CS is managing it

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PABX replacement and downsizing

- Objective:
  - Enable cost-effective replacement of the 20+ year old telephone exchange.
  - Install simple IP-to-Analog gateways for services that cannot be phased out, notably the red phones.
- Type of intervention: equipment replacement

- Impacted locations:
  - LHC and underground experimental caverns
- Impact on users:
  - Red phones unavailable (voice) in specific sectors for periods of up to 1 hour
- Impact on service if not done or postponed:
  - This could lead to higher outage rates, impossibilities to repair for hardware out of warranty/discontinued
  - Expensive for CERN to operate
- Proposed period for implementation:
  - Beginning of LS2
- Estimated duration:
  - 6 Months
- External resources:
  - No need, IT-CS will manage this internally


Main PABX building 58

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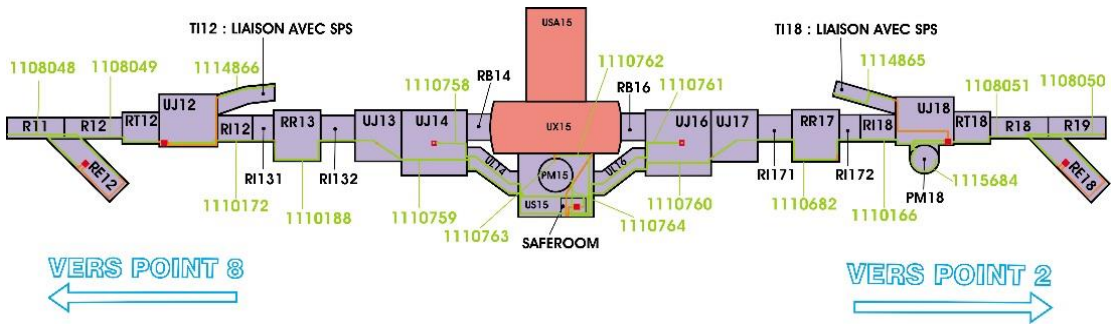
Adding a new Leaky Feeder cable (LF)

- Objective:
  - Ease the replacement of the existing, degraded, LF cable during LS3
  - Ensure redundancy for radio and mobile services beyond LS2
  - Increase bandwidth for mobile data services
- Type of intervention: consolidation
- Impacted locations:
  - LHC and its experiments, all injector chain and experiments...
  - 50+ km of cable to deploy
- Impact on users:
  - Radio (TETRA) and mobile services (2G/3G/4G) would be maintained
  - Sections of tunnels inaccessible during LF installation
- Impact on service if not done or postponed:
  - Impossibility to repair damage LF cable
  - Absence of Radio (TETRA) and mobile services (2G/3G/4G) in “large” sections
- Proposed period for implementation:
  - During LS2, with potential for preparatory works during EYETS
  - Work to be scheduled to fit within LS planning
- Estimated duration:
  - All LS2
- External resources:
  - Extensive need of EN/EL resources and integration team
  - Budget is missing for now (~4 MCHF; more if higher radiation resistance required)



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IT CS Services during LS2 (and now...)

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The Technical Network (TN)

- Service definition:
  - High speed and reliable fixed network connectivity for accelerator control
  - Protected from external access
  - 10Mbps / 100Mbps / 1Gbps connection
  - Available across almost all accelerator and experimental infrastructure provided there are UTP plugs (must be less than 90 meters from a starpoint)
    - *Network plug locations & starpoints are located in the GIS portal*
  - Wi-Fi not allowed on TN network

- Situation :
  - The service is globally maintained during LS2 (refer to previous slides)
  - Locations of outlets and starpoints in the GIS portal (IT_Outlets + IT_StarPoint)
    - https://gis.cern.ch/gisportal/IT_Equipment.htm
- Constraints
  - Network extensions (e.g. new network plugs or new starpoints) take several weeks to be implemented

- Contact name in IT/CS: John Shade

Advantages/Drawbacks:

+Operated by CERN
+Fully operational
+High data transfer
+Low latency
+ Permanent and reliable solution

- Network plugs are 90 meters max from starpoints

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VDSL & Wi-Fi inside the LHC tunnel

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- Service definition:
  - VDSL : Very high bit rate Digital Subscriber Line (Similar to your ADSL line at Home)
  - Plugs available every 100m in LHC tunnel connected to GPN(*)
  - MAX ~20Mbps full-duplex (upload and download)
  - VDSL-Wi-Fi Access point: coverage <40 meters from the plug
    - 802.11bg (2.4GHz) Max 22Mbps half-duplex shared
    - Available from the Telecom Lab
    - Installed by the users
    - Must be removed during the run

- Situation :
  - Wi-Fi coverage of LHC during LS2 not planned.
  - Switches out of warranty in 2017
  - Coverage information can be found in the GIS portal
    - https://gis.cern.ch/gisportal/IT_Equipment.htm
- Constraints:
  - Need for power plug around the working location
  - Not convenient to install (on the cable tray over the LHC)
- Contact name in IT/CS: John Shade

Advantages/Drawbacks:

+Operated by CERN
+Fully operational
+Medium data transfer
+Low latency

- Only in LHC
- Access point managed by the user
- Difficult physical access to VDSL plugs
- Subject to power cuts (maintenance)

***(*) GPN** = General purpose network*

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Radio services :TETRA

- Service definition
  - TETRA (Terrestrial Trunked Radio) is a secured radio network
  - In parallel, allow French and Swiss fire brigades to intervene in CERN accelerator complex with their own radio device
- Key features:
  - Almost full outdoor/indoor coverage
  - High level of reliability and availability (all active equipment are on UPS)
  - SDS messages (like SMS) 140 characters maximum/message
  - Outdoor and Indoor geo-localization
    - Indoor localiation is not 100% guaranted (beacons are damaged in “high” radiation areas)
    - Indoor localization is not availbale in surface buildings
  - Lone worker protection
  - Can be used as a safety device provided that your safety manager (DSO, GLIMOS, GL, etc.) authorized its use for the planned work
- Situation:
  - Fully operational
    - ILS yet to be deployed in CMS/ATLAS/ALICE
  - Coverage will be put in the GIS portal (IT_beacons + Mobile_coverage)
    - https://gis.cern.ch/gisportal/IT_Equipment.htm
- Contact name in IT/CS: Aurélie Pascal

Advantages/Drawbacks:

+Fully operated by CERN
+Designed for safety
+Infrastructure costs covered by CERN
+Group communications
+Outdoor & indoor geo-localization

- Very Poor performances for data transfers
- Specific and expensive terminals
- Available only on CERN “region”

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Wi-Fi in technical areas

- Service definition:
  - Access to CERN General purpose network only!
  - 802.11n from 120Mbps to 260Mbps Half-duplex Shared
  - Recommended max 25 stations per cell
  - Difficulty to deal with multi-path environment such as underground, Antennas with spatial diversity, leaky feeder or MIMO system are required
- Situation
  - ~ 40 Access Points in the UA/UJ/UL
  - Extensions are limited: network outlets not available everywhere
- Contact name in IT/CS: John Shade

Advantages/Drawbacks:

+Operated by CERN
+Fully operational (where available)
+No need for special terminals
+High data transfer
+Low latency

- Expensive installation
- Limited coverage

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Mobile Services: 2G/3G/4G technologies

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- Service definition:
  - Available almost everywhere at CERN, both indoors and outdoors
  - Voice traffic: Huge capacity...
  - Messaging: SMS/MMS
  - Data transfer allows access to Internet OR CERN GPN through a mobile device (phone or USB dongle):
    - No extra cost when on the Swisscom network
    - Maximum theoretical data transfer rate :
      - 150 Mbits/s in LHC pits
      - 40 Mbit/s elsewhere (tunnels, injectors, experiments,...)
      - Latency : ~10ms
      - More than adequate for real time Video calls
    - Smartphones (Samsung) are available at CERN stores

  - We strongly encourage the use of mobile data services rather than Wi-Fi in the accelerators and in experimental areas
    - Special tests can be done on-demand if needed
- Situation:
  - Fully operational
  - Use this service in priority for data exchange from underground
  - If subcontractors => promote CERN subscriptions to avoid paying when calling them!
- Contact name in IT/CS: Rodrigo Sierra

Advantages/Drawbacks:

+Infrastructure costs covered by CERN
+No extra costs when used in Switzerland
+Fully operational
+No need for special terminals

- Operated by Swisscom

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What is most appropriated for your communications?

	TN	TETRA	Wi-Fi(*)	Wi-Fi + VDSL(**)	2G/3G/4G
Safety	No	Yes (with DSO approval)	No	No	No
Reliability	Excellent	Excellent	Excellent	Excellent	good
Data rate	Excellent	Very limited	Excellent	Good	Excellent
Latency (is real time ok?)	Excellent	N.A.	Excellent	Excellent	Excellent (3G/4G)
Costs (from user point of view)	Expensive	Terminals	Expensive	Access Point	Low

(*)There is no Wi-Fi on the TN network
(**) Available only in LHC, and again no Wi-Fi on TN network

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Summary of network services in CERN accelerator and experimental areas

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		Fixed Serv.	Wireless Serives			
				Mobile (2G/3G/4G)		TETRA	
		Technical Network	Wi-Fi	Standard Coms.	Data UMTS / LTE	Safety Coms.	Indoor Localisation
LHC	Tunnel		With KIT				
	Experiments						
	REs						
	UAs, UJs, USs						
Injectors	PSB						
	PS, PSB					Partial	
	SPS						
	LINAC4		With KIT				
	LINAC II, III						
	Ti8-Ti2						
	TT2-TT10-TT40-TT41-TT81-TT82-TT83-TT84-TT85-TDC85						Partial (not in TT8x of North area)
Exp.	AD		Hall				
	Isolde						
	ECN3				Partial (no LTE)		
	SM18						
	North Hall, N_TOF, DIRAC, CFT3, 2010, Irrad, Charm, East area						
	ISRs					Partial	

	Fullly completed
	Will be completed
	Fully completed but local coverage
	ILS beacon functioning not guaranteed

TN:	Up to 1Gbps
Wi-Fi:	Up to 240 Mbps or 80 Mbps
3G:	Up to DL:7Mbps / UL: 1Mbps
4G:	Up to DL: 40Mbps / UL: 14Mpbs

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THANKS

Questions ?

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